

REGENERATIVE ELECTROCHEMICAL CELL SYSTEM AND METHOD FOR
USE THEREOF

Abstract

[0066] An exemplary embodiment of the regenerative electrochemical cell system comprises: a fuel cell module comprising a fuel cell oxygen inlet in fluid communication a water storage device, and a fuel cell hydrogen inlet in fluid communication with both an oxygen source and with a gaseous portion of an water phase separation device; an electrolysis module comprising an electrolysis water inlet in fluid communication with the water storage device via a fuel cell oxygen outlet, and an electrolysis water outlet in fluid communication with the fuel cell hydrogen.

[0067] One of the embodiments for operating a regenerative electrochemical cell system disclosed herein, comprises: introducing feed hydrogen from a hydrogen storage system to a fuel cell hydrogen electrode and introducing feed oxygen from an oxygen/water phase separation device to a fuel cell oxygen electrode; reacting hydrogen ions with the oxygen to generate electricity and water; once the fuel cell has attained operating conditions, ceasing the feed oxygen from the oxygen/water phase separation device, and introducing second oxygen from a surrounding atmosphere module to the fuel cell oxygen electrode; directing the water to a water storage device; introducing water to an electrolysis water electrode and power to an electrolysis module, to produce refuel hydrogen and oxygen; and directing the refuel hydrogen to the hydrogen storage device.